E

Category L-A, Concrete Examinations

Tab E - Inspector Certification Records

Examiner	Method	Level
Chris Sward	VT-1C, VT-3C	II
Rajagopal Namperumal	VT-1C, VT-3C	II

EXHIBIT A

CONTAINMENT ISI VT-C EXAMINER

CERTIFICATION RECORD

This record certifies that

Name: Chris Sward

SSN: [redacted]

has been examined in accordance with Project Instruction IP2-CISI-006, Revision 0 and has demonstrated the ability to perform the duties of VT-C Examiner for the methods listed below and is hereby certified to the level noted.

Method	Level
VT-1C	II
VT-3C	II

Certified by:

Name: _____ Date: 5/23/00
Responsible Engineer

Expiration Date: 5/23/2003

EXHIBIT B

CONTAINMENT ISI VT-C EXAMINER

VISION EXAMINATION RECORD

Name: Chris Sward

SSN: [redacted]

Near Distance:

Natural or corrected near-distance vision of 20/25 or greater Snellen fraction in at least one eye by reading words or characters with letters 0.022 inches in height on a standard Jaeger test chart at a distance of not less than 12 inches, or by equivalent method.

Method: ☐ Jaeger Test Chart Character height verified: ☐

☒ Alternate (describe) Light house Near Visual Acuity Test

Acuity: OD .4M or 20/20
OS .3M or 20/15

☐ Acceptable ☒ Acceptable With Correction ☐ Unacceptable

Far Distance:

Natural or corrected far-distance vision of 20/30 or greater Snellen fraction, or equivalent, in at least one eye: OD 20/20

Acuity: OS 20/20

☐ Acceptable ☒ Acceptable With Correction ☐ Unacceptable

Color Perception:

Demonstrates capability of distinguishing and differentiating contrast between colors

Method:

☒ Ishihara color plates

☐ Alternate (describe) _____

☒ Acceptable ☐ Unacceptable

Testing Conducted by:

Name: Bill Wyssman Title: O.D.

Address: Carson Pirie Scott
1 South State Street (312) 841-7393

Signature: Bill Wyssman OD. Date: 5-23-00

EXHIBIT C

CONTAINMENT ISI VT-C EXAMINER

EDUCATION RECORD

Name: Chris Sward

SSN: [redacted]

HIGH SCHOOL & COLLEGE EDUCATION			
NAME & LOCATION OF SCHOOL	TYPE OF SCHOOL	DATES ATTENDED	GRADE/ DEGREE ACHIEVED
Rockford East High School Rockford, IL	High School	1971-1975	—
Illinois State University Normal, IL	College	1975-1977	—
University of Illinois Urbana, IL	College	1977-1979	BS

Records Attached:

- ☐ Transcript
- ☒ Diploma
- ☐ Letter
- ☐ Telephone Memorandum
- ☐ Other _____

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD

Name: Chris Sward

SSN: [redacted]

I. RELATED WORK EXPERIENCE

COMPANY & JOB TITLE	WORK PERFORMED	HOURS	FROM		TO	
			MO.	YR.	MO.	YR.
Sargent & Lundy Structural Engr.	Marble Hill concrete repair program	>600 hrs	01	'82	03	'83
Sargent & Lundy Sr. Structural Engr.	Braidwood construction assessment program		07	'84	10	'85
Sargent & Lundy Sr. Structural Engr.	Watts Bar construction verification		05	'88	03	'89
Sargent & Lundy Engineering Supervisor	Byron/Braidwood tendon ISI work		1992, 1993 & 1996 surveillances			
Sargent & Lundy Project Engineer	ComEd ISI prog. development tasks		05	'97	09	'97
Sargent & Lundy Project Engineer	Crystal River Cont. ISI prog. development		01	'98	09	'98
Sargent & Lundy Sr. Project Engineer	Nine Mile Point Cont ISI development		05	'99	12	'99
Sargent & Lundy Project Engineer	Salem/Hope Creek miscellaneous structures monitoring MSP.	~120 hrs	06	'96	07	'96

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD (cont.)

Name: Chris Sward

SSN: [redacted]

II. PREVIOUS CERTIFICATIONS						
COMPANY	METHOD	LEVEL	BY TEST		CODE OR SPEC.	YEAR REC'D
			YES	NO		
None						

EXHIBIT E

CONTAINMENT ISI VT-C EXAMINER

TRAINING RECORD

Name: Chris Sward

SSN: [redacted]

TRAINING COURSES COMPLETED				
TYPE	LOCATION	HOURS	TRAINING DATE(S)	INSTRUCTOR SIGNATURE & DATE
VT-1C	S&L Chicago office	6	5/10/00	James G. Doyle 5/10/00
VT-3C	S&L Chicago office	6	5/10/00	James G. Doyle 5/10/00

EXHIBIT F

CONTAINMENT ISI VT-C EXAMINER

EXAMINATION RECORD

Name: Chris Sward

SSN: [redacted]

I. INDIVIDUAL EXAMINATION RESULTS

METHOD	LEVEL	EXAM	GRADE	DATE	EXAMINED BY
VT-1C	II	Practical	100%	5/10/00	J. Doyle
VT-3C	II	Practical	100%	5/10/00	J. Doyle
VT-1C	II	General	95%	5/21/00	S. Davis
VT-1C	II	Specific	100%	5/21/00	S. Davis
VT-3C	II	General	90%	5/21/00	S. Davis
VT-3C	II	Specific	87%	5/21/00	S. Davis

II. COMPOSITE SCORE

METHOD	LEVEL	BASIC (LEVEL III)	GENERAL/ METHOD	SPECIFIC	PRACTICAL/ DEMONSTR.	COMPOSITE
VT-1C	II	—	95%	100%	100%	98%
VT-3C	II	—	90%	87%	100%	92%

By authority of the Board of Trustees of the

UNIVERSITY OF ILLINOIS

and upon recommendation of the Senate

at Urbana - Champaign

Chris Alan Suard

has been admitted to the Degree of

Bachelor of Science in Civil Engineering

Honors

and is entitled to all rights and honors thereto appertaining

Witness the Seal of the University and the signatures of its Officers

this twentieth day of May, nineteen hundred and seventy-nine.

President of the Board of Trustees

Secretary of the Board of Trustees

President of the University

Chancellor

Chris Sward 5/21/00

CHRIS A SWARD

NUCLEAR POWER STRUCTURAL & CIVIL ENGINEERING
ENGINEERING MANAGER

Education

University of Illinois, Urbana - B.S. Civil Engineering - 1979

Registrations

Professional Engineer - Illinois

Proficiencies

Program Management
Nuclear Plant Modification Design
Structural Design and Engineering
Design Basis Criteria Development
Containment Inservice Inspection
Structures Condition Monitoring
Construction Verification
Value Engineering

Responsibilities

As a Program Manager, Mr. Sward is responsible for the management of all engineering activities associated with an individual program or small project. He interfaces with principal client engineers, develops project scoping, prepares cost estimates and schedules, coordinates multi-discipline design activities, monitors and controls budgets, and maintains schedules. He has overall responsibility for cost and schedule performance and the quality of program deliverables.

As an Engineering Manager, Mr. Sward is responsible for coordinating the activities of civil and structural engineers and architects engaged in the design and engineering of various facilities. He performs or manages all aspects of the design including criteria development, detailed design, calculations, drawing production and specification writing. He is responsible for the conformance of project work to project design criteria, Sargent & Lundy policy and procedures, and applicable codes and standards.

Experience

Mr. Sward has considerable experience in Containment Inservice Inspection (CISI). This experience includes a recent effort in CISI program development and implementation pursuant to the requirements of 10CFR50.55a. This includes work on all of ComEd's nuclear units, Crystal River, Nine Mile Point and Indian Point 2. Related past experience includes involvement in containment post tensioning inspections per Regulatory Guide 1.35 requirements.

Mr. Sward has extensive experience in the design of nuclear power plants. His background includes new plant design, plant modification design and modification package development, on-site engineering support of construction activities, engineering support for plant operation, maintenance and modification activities, preparation and maintenance of design criteria, and verification and inspection program work.

Most of Mr. Sward's recent assignments have been as Program Manager and/or Structural Lead for nuclear plant modification projects. This experience has involved a variety of projects on several domestic nuclear power plants. His work

encompassed project planing (i.e., scoping, cost estimating, scheduling, and work plan development) and management efforts as well as hands-on design engineering, and modification package development.

Mr. Sward has been involved in the design of all types of nuclear plant structural components including main building elements and component supports. He previously supervised the structural design activities associated with plant modifications and design basis maintenance for ComEd's Byron and Braidwood stations. During construction of the Braidwood station, he worked at the project site supervising a group of engineers whose primary function was technical support of miscellaneous structural construction activities. His group performed walkdowns and interacted with contractor personnel to resolve field problems. They also performed design calculations as needed for assessment of field as-built conditions and evaluation of design changes requested by the client or contractor and issued design change documents.

Mr. Sward previously developed a structures condition monitoring program for implementation of 10CFR50.65, the Maintenance Rule, for the Salem and Hope Creek nuclear stations. This effort involved the identification of structures within the scope of the Maintenance Rule, review of existing programs, development of examination requirements and criteria, and performance of baseline examinations.

Mr. Sward has worked on several projects related to the development of structurally based technical standards and criteria documents. One such assignment was the development of a design criteria document for component supports for Niagara Mohawk Power Company's Nine Mile Point Unit 1. This assignment involved researching and compiling existing design basis information and developing additional criteria for use in future design work. Another assignment involved the compilation of details and design requirements from source documents into specific standards for the design of raceways and the development of standardized prequalified details.

Mr. Sward has been involved in a number of verification projects on nuclear plants. For Tennessee Valley Authority's Watts Bar station he was the supervisor of a multi-discipline group of engineers for the construction verification portion of a vertical slice review. This task reviewed installed plant hardware to verify conformance with design output documents. It entailed identification of essential elements and attributes to be reviewed, establishment of review criteria, reinspection of hardware, reporting of observations, review of client responses, and preparation of a final report. For the Braidwood station he was part of the staff involved in a construction assessment program. He worked in the engineering group to define inspection requirements, prepare checklists, establish acceptance criteria for reinspections, assemble inspection packages, coordinate activities with inspection personnel, and evaluate the results of the reinspections. In an earlier assignment, he worked as part of a site team tasked with examining and repairing concrete elements of the building structure.

Mr. Sward has been involved on several DOE waste management projects for

Argonne National Laboratory. One entailed preliminary and detailed design for the conversion of a decommissioned reactor building into a radioactive waste storage facility. Another involved preliminary design for rehabilitation of a waste processing facility. These projects included structural modifications, significant HVAC system and HEPA filtration modifications, electrical upgrades and other facility improvements. Mr. Sward coordinated the design activities of a multi-discipline team and performed or supervised the performance of all civil/structural/architectural designs. He was also involved in cost reduction efforts and formal value engineering processes.

Mr. Sward also has experience on a number of fossil-fueled projects. He was involved in the design of Nova Scotia Power Company's Point Aconi station, the world's largest fluidized bed boiler unit. He was responsible for the design of the building foundation, turbine pedestal, gas ductwork and other miscellaneous components. He has also worked on modification projects for several fossil stations.

His relevant experience includes:

NUCLEAR SERVICES

- **Consolidated Edison**
  - Indian Point Unit 2.

    Senior Project Engineer. Development of ASME Section XI Containment Inservice Inspection Program. (1999)

- **Niagara Mohawk Power Corp.**
  - Nine Mile Point Unit 2.

    Senior Project Engineer. Development of ASME Section XI Containment Inservice Inspection Program. (1999)

- **Carolina Power & Light**
  - Shearon Harris.

    Senior Project Engineer. Program Management of several plant modification projects including spent fuel pool rack installation and auxiliary boiler dererating. (1998 to 1999)

- **Florida Power Corporation**
  - Crystal River Unit 3.

    Project Engineer/Senior Project Engineer. Program Management of several multi-discipline engineering projects including emergency diesel generator replacement studies, diesel generator radiator replacement modification, seismic qualification of SQUG outliers and development of containment ISI program. (1997 to 1998)

- **Public Service Electric and Gas Company**
  - Hope Creek/Salem Unit 1 & 2.

    Project Engineer. Development and implementation of a structures conditior monitoring program for implementation of Maintenance Rule requirements. (1996)

  - Hope Creek/Salem 1 and 2.

    Senior Structural Engineer. Development of technical standards. (1989)

- **ComEd**
  - Byron 1& 2/Braidwood 1 & 2,
  - Dresden 2 and 3,
  - LaSalle 1 & 2,
  - Quad Cities 1 & 2,
  - Zion 1 & 2.

    Project Engineer. Program Manager for development of design basis information for containment ISI Program .(1997)

  - Byron 1 & 2/Braidwood 1 & 2.

    Structural Engineering Supervisor/ Project Engineer. Structural design relate to misc. plant modifications, program management, technical training. (1991 1996)

- **Niagara Mohawk Power Company**
  - Nine Mile Point Unit 1.

    Project Engineer. Development of design criteria document. (1994)

- **Tennessee Valley Authority**
  - Watts Bar 1 and 2, 1177 MW each.

    Senior Structural Engineer. Construction reinspection program. Identificatio of licensing commitments and development of design criteria. (1987 to 1989

- **Omaha Public Power District**
  - Fort Calhoun 1, 478 MW.

    Senior Structural Engineer. Development of structural portions of welding engineering guideline. (1988)

PLANT DESIGN

- **Argonne National Laboratory**
  - Radioactive Waste Storage Facility

    Project Engineer. Program management; structural steel, foundation, and concrete design. (1994 to 1995)

- **Nova Scotia Power Corporation**
  - Point Aconi, coal, 600 MW.

    Senior Structural Engineer. Design of foundations, structural steel, and flue gas ductwork. (1990 to 1991)

- **Commonwealth Edison Company**
  - Braidwood 1 & 2, nuclear.

    Senior Structural Engineer. Inspection programs and onsite engineering support of construction activities. (1984 to 1987)

  - Byron 1 & 2/Braidwood 1 & 2, nuclear.

    Senior Structural Engineer. Miscellaneous structural activities. (1984)

- **PSI Energy**
  - Marble Hill 1 & 2, nuclear.

    Structural Engineer/Senior Structural Engineer. Raceway and HVAC supports and onsite engineering support of construction activities. (1980 to 1983)

- **Wisconsin Electric**
  - Edgewater 5, coal.

    Structural Engineer. Structural steel design. (1979 to 1980)

VT-1C General Examination

Name Chris Sward Date 5/21/00

Weighing Factor 33.3% Grade 95%

Graded by [signature] Date 5/21/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 20 questions relating to the general requirements and basic principles of the VT-1C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this general test is a requirement of ASME Section XI an SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature] 5/21/00

Level II Candidate Date

[signature] 5/23/00

Responsible Engineer Date

VT-1C Specific Examination

Name Chris Sward Date 5/21/00

Weighing Factor 33.3% Grade 100%

Graded by [signature] Date 5/21/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 15 questions relating to the specific procedural and ASME Section XI requirements for the VT-1C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this specific test is a requirement of ASME Section XI an SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature] 5/21/00

Level II Candidate Date

[signature] 5/23/00

Responsible Engineer Date

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Chris Sward

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-1C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James M. Doyle Date: 5/10/00

VT-3C General Examination

Name Chris Sward Date 5/21/00

Weighing Factor 33.3% Grade 90%

Graded by [signature] Date 5/21/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 20 questions relating to the general requirements and basic principles of the VT-3C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this general test is a requirement of ASME Section XI an SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature] 5/21/00

Level II Candidate Date

[signature] 5/23/00

Responsible Engineer Date

VT-3C Specific Examination

Name Chris Sward Date 5/21/00

Weighing Factor 33.3% Grade 87%

Graded by [signature] Date 5/21/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 15 questions relating to the specific procedural and ASME Section XI requirements for the VT-3C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this specific test is a requirement of ASME Section XI an SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature] 5/21/00

Level II Candidate Date

[signature] 5/22/00

Responsible Engineer Date

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Chris Sward

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-3C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: Jeremy L. Doyle Date: 5/10/00

EXHIBIT A

CONTAINMENT ISI VT-C EXAMINER
CERTIFICATION RECORD

This record certifies that

Name: Rajagopal Namperumal

SSN: [redacted]

has been examined in accordance with Project Instruction IP2-CISI-006, Revision 0 and has demonstrated the ability to perform the duties of VT-C Examiner for the methods listed below and is hereby certified to the level noted.

Method	Level
VT-1C	II
VT-3C	II

Certified by:

Name: _____ Date: 5/23/00
Responsible Engineer

Expiration Date: 5/23/2003

EXHIBIT B

CONTAINMENT ISI VT-C EXAMINER

VISION EXAMINATION RECORD

Name: RAJAGOPAL NAMPERUMAL

SSN: [redacted]

Near Distance:

Natural or corrected near-distance vision of 20/25 or greater Snellen fraction in at least one eye by reading words or characters with letters 0.022 inches in height on a standard Jaeger test chart at a distance of not less than 12 inches, or by equivalent method.

Method: ☑ Jaeger Test Chart Character height verified: ☑

☐ Alternate (describe) _____

Acuity: J1

☐ Acceptable ☑ Acceptable With Correction ☐ Unacceptable

Far Distance:

Natural or corrected far-distance vision of 20/30 or greater Snellen fraction, or equivalent, in at least one eye.

Acuity: R 20/25 / L 20/200

☐ Acceptable ☒ Acceptable With Correction ☐ Unacceptable

Color Perception:

Demonstrates capability of distinguishing and differentiating contrast between colors

Method:

☑ Ishihara color plates

☐ Alternate (describe) Normal

☒ Acceptable ☐ Unacceptable

Testing Conducted by:

Name: F. David Cox MD Title: _____

Address: 608 S Washington St
Naperville IL 60540

Signature: [signature] Date: 5-12-00

EXHIBIT C

CONTAINMENT ISI VT-C EXAMINER

EDUCATION RECORD

Name: RAJAGOPAL NAMPERUMAL

SSN: [redacted]

HIGH SCHOOL & COLLEGE EDUCATION			
NAME & LOCATION OF SCHOOL	TYPE OF SCHOOL	DATES ATTENDED	GRADE/ DEGREE ACHIEVED
S. DAK. SCHOOL OF MINES & TECH. RAPID CITY, SOUTH DAKOTA	COLLEGE	2/70 – 5/71	MS (CIVIL ENG.)

Records Attached:

- ☐ Transcript
- ☑ Diploma
- ☐ Letter
- ☐ Telephone Memorandum
- ☐ Other _____

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD

Name: RAJAGOPAL NAMPERUMAL

SSN: [redacted]

I. RELATED WORK EXPERIENCE

COMPANY & JOB TITLE	WORK PERFORMED	HOURS	FROM		TO	
			MO.	YR.	MO.	YR.
DELTA ENGINEERING INC PROJECT ENGINEER	CONCRETE INSPECTION & RESTORATION PROJECTS	200 hrs	5	1994	6	1997
	FOR THE FOLLOWING: 16 STORY CHA Wm. GREEN					
	APARTMENT (2) BLDGS, ROCK ISLAND TRAIL					
	BRIDGE (2) PIER REPAIRS/MODIFICATIONS, MADISON STREET VIA-					
	DUCT SUBSTRUCTURE MODIFICATION, APPROACH					
	ROADWAY SUPPORT CONC. STRUCTURES OF ADAM STREET BASCULE					
	BRIDGE & TORRENCE AVE LIFT BRIDGE.					
SARGENT & LUNDY, ENGINEERS SENIOR ENGINEER	CONTAINMENT DESIGN, ANALYSIS, TESTING &		6	1973	1	1994
	EVALUATION (CLINTON, LaSALLE, BYRON/BRAIDWOOD KNGR-KOREAN CONCRETE		6	1997	TO DATE	
	CONTAINMENTS) ISI/ILRT INSPECTION					
	PROGRAM DEVELOPMENT (GRAND GULF, CRYSTAL RIVER CONTAINMENTS)					
	PREDICTION OF PRESTRESS LOSS & POST-TENSIONING					
	TENDON FORCES, ISI & STRUCTURAL INTEGRITY EVALUATION.					
	CONTAINMENT ULTIMATE PRESSURE CAPACITY EVALUATION,					
	DESIGN TOPICAL REPORTS (KNGR)					
	STRUCTURAL MAINTENANCE & REHAB PROGRAM FOR BYRON NDCT.					

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD (cont.)

Name: RAJAGOPAL NAMPERUMAL

SSN: [redacted]

II. PREVIOUS CERTIFICATIONS NONE

COMPANY	METHOD	LEVEL	BY TEST		CODE OR SPEC.	YEAR REC'D
			YES	NO		

EXHIBIT E

CONTAINMENT ISI VT-C EXAMINER

TRAINING RECORD

Name: Rajagopal Namperumal

SSN: [redacted]

TRAINING COURSES COMPLETED				
TYPE	LOCATION	HOURS	TRAINING DATE(S)	INSTRUCTOR SIGNATURE & DATE
VT-1C	S&L Chicago office	6	5/10/00	James M. Doyle 5/10/00
VT-3C	S&L Chicago office	6	5/10/00	James M. Doyle 5/10/00

EXHIBIT F

CONTAINMENT ISI VT-C EXAMINER

EXAMINATION RECORD

Name: Rajagopal Nampervmal

SSN: [redacted]

I. INDIVIDUAL EXAMINATION RESULTS

METHOD	LEVEL	EXAM	GRADE	DATE	EXAMINED BY
VT-1C	II	General	75%	5/22/00	C. Sward
VT-1C	II	Specific	100%	5/22/00	C. Sward
VT-3C	II	General	85%	5/22/00	C. Sward
VT-3C	II	Specific	93%	5/22/00	C. Sward
VT-1C	II	Practical	100%	5/10/00	J. Doyle
VT-3C	II	Practical	100%	5/10/00	J. Doyle

II. COMPOSITE SCORE

METHOD	LEVEL	BASIC (LEVEL III)	GENERAL/ METHOD	SPECIFIC	PRACTICAL/ DEMONSTR.	COMPOSITE
VT-1C	II	--	75%	100%	100%	92%
VT-3C	II	--	85%	93%	100%	93%

South Dakota School of Mines and Technology

The South Dakota Regents of Education on nomination of
the Faculty of the School of Mines and Technology
have conferred upon

Rajagopal Namperumal

the Degree of

Master of Science in Civil Engineering

With all the Rights, Privileges and Honors as well as the Obligations and Responsibilities thereto appertaining.

Conferred at Rapid City in the State of South Dakota this
28th day of May, 1971.

President of The Regents of Education

President of The School of Mines and Technology

Sargent & Lundy LLC

RAJAGOPAL NAMPERUMAL
Nuclear Plant Division
Senior Engineer

R. Namperumal
5.22.2000

EDUCATION

University of Illinois at Chicago - Ph.D. Course Work in Structural Mechanics - 1971 to 1973

South Dakota School of Mines and Technology - M.S. Civil Engineering - 1971

University of Madras, India - M.S. Structural Engineering - 1968

University of Madras, India - B.S. Civil Engineering - 1964

PROFICIENCIES

Containment Design Analysis Testing & Evaluation
IWE/IWL Inspection Program Development
Prediction of Prestress Loss & Post-Tensioning Tendon Forces
Post-Tensioning ISI and Structural Integrity Evaluation
Containment and Liner Evaluation for Severe Accident
Containment Ultimate Pressure Capacity Evaluation
Seismic and Dynamic Analysis of Plant Structures
Steel and Concrete Structures Design
Foundations and Retaining Structures Design
Structural Maintenance & Rehabilitation Programs
Project Structural Design Criteria and Specifications
Independent Review of Structural Systems Analysis and Design
Project Coordination and Technical Supervision

RESPONSIBILITIES

Mr. Namperumal is responsible for the preparation of design and construction documents for containment and plant structures. He prepares and reviews design and analysis calculations, reviews design and vendor drawings, prepares design specifications and reports, and evaluates test reports. He reviews and predicts tendon forces for the containment post-tensioning tendon surveillances, resolves non-conformances and reviews ISI reports. He also interfaces with clients, vendors, and field engineers and resolves field engineering problems as required.

Currently Mr. Namperumal is involved in the development of Code Boundary Documents and inspection drawings for the containment IWE/ISI Inspection Program Plans for concrete and steel containments for the implementation of the recent 10CFR50.55a Rule.

EXPERIENCE

Mr. Namperumal has over 20 years of experience in the design, analysis, design review, field engineering support, testing and evaluation of nuclear containments and structures.

His experience includes detailed analysis and design of various aspects of PWR and BWR (Mark I, II, and III) containments; plant seismic and suppression pool hydrodynamic analyses; liner design, large penetrations, reactor pedestal and other internal structures and preparation of FSAR sections related to containment design; design and as-built analysis of pipe whip restraints for large-bore and small-bore high energy piping and resolution of field construction problems; assessment of liner and structures for pipe break and internally generated missile impacts; structural integrity testing and in plant SRV testing; and prediction of the ultimate internal pressure capacity of post-tensioned concrete containment by hand calculations and verification by detailed non-linear analysis using as-built material properties.

His plant betterment support work includes design of high density fuel rack system and evaluation of spent fuel pool structures including yield line analysis for rack impact and updating technical evaluation reports; assessment of building roofing and support steel structure for turbine building re-roofing; evaluation of pressure capacity of HVAC duct grills from the laboratory qualification testing criteria; plenum and duct support qualification for revised

seismic loads; and cooling section modification for a natural draft cooling tower.

Mr. Namperumal has also participated in special studies which include design assessment of containment liner buckling and concrete stresses due to higher than normal/design temperatures resulting from RPV insulation problems in a BWR Mark II containment; evaluation report on a tested low wire strength tendon in response to NRC concerns on the containment post-tensioning system performance and containment integrity; and design of a removable concrete plug in the prestressed concrete containment shell for a construction feasibility study of Steam Generator Replacement for Electric Power Research Institute (EPRI).

Most recently, Mr. Namperumal was involved in the corrosion inspection, condition rating, repair and rehabilitation of 3 Chicago Style Double-Leaf Bascule Bridges and a vertical lift bridge as an employee of an outside organization.

Mr. Namperumal joined Sargent & Lundy in 1973. His relevant experience includes:

PLANT IWE/ISI PROGRAMS

- **Entergy Operations, Inc.**
  - Grand Gulf Nuclear Station
    Development of Code Boundary Document, IWE/ISI Program Plan and Inspection Drawings

- **Commonwealth Edison Company**
  - Dresden 2 and 3, Quad Cities 1 and 2, LaSalle 1 and 2
    Senior Engineer. Development of Code Boundary document for IWE/ISI Program. (1997 to present)

PLANT DESIGN

- **Commonwealth Edison Company**
  - Byron 1 and 2/Braidwood 1 and 2, nuclear, 1175 MW each.
    Structural Engineer/Senior Engineer. Evaluation of the containment post-tensioning system inservice-inspection results and resolution of inspection problems and non-conformances. Design and construction assistance of a prototype modular fill support steel structure inside the cooling section of the natural draft cooling tower at Byron station and Structural maintenance programs at the cooling section. Analysis and design of pipe whip restraints, evaluation of energy absorbing materials. Dome embedments for spray supports. Design assessment of primary and secondary shield walls, and internal concrete structures for pipe impacts due to high energy line break. (1984 to 1991)

  - LaSalle 1 and 2, nuclear, 1122 MW each.
    Evaluation of tendon elongations during tendon surveillances, preparation of engineering evaluation report on a tested low wire strength tendon and containment integrity, and preparation of response to NRC questions and concerns on the containment post-tensioning system performance. (1988 to 1989)

    Senior Structural Engineering Specialist. Supervision and coordination. Design, analysis for the containment suppression pool hydrodynamic loads, preparation of design assessment reports, support of plant licensing activities, Structural Integrity testing and SRV testing of the containment including evaluation of results and preparation of engineering reports, analysis of reactor crane system, prediction of prestress loss and tendon forces for the containment tendon surveillances and preparation of input for technical specifications and revisions to the FSAR. (1980 to 1984)

- **Korea Electric Power Corporation**
  - Yonggwang 3 and 4, nuclear, 1000 MW each.
    Structural Engineer. Containment and internal structures and pipe whip restraints design criteria input; independent review of seismic analysis of containment structure. (1987 to 1988)

- **Illinois Power**
  - Clinton 1, nuclear, 985 MW.
    Senior Structural Engineering Specialist. Supervision and coordination of engineers. Design and assessment of the reinforced concrete containment for the revised containment hydrodynamic load specifications; interface with the NSSS vendor on containment load verification program; and preparation of FSAR sections related to containment design. (1978 to 1980)

    Structural Engineering Specialist. Design analysis of containment shell, including detailed analysis and design of large openings and reactor support pedestal. (1976 to 1978)

- **Northern Indiana Public Service Company**
  - Bailly N-1, nuclear, 684 MW.
    Structural Engineering Specialist. Seismic analysis of the containment-auxiliary-turbine building complex. (1974 to 1975)

- **The Cincinnati Gas & Electric Company**
  - Zimmer 1, nuclear, 839 MW.
    Structural Engineer. Design and analysis of concrete and structural steel framing systems and stability analysis of intake structure. (1973 to 1974)

PLANT BETTERMENT

Insert 5

- **The Toledo Edison Company**
  - Davis-Besse 1, nuclear, 874 MW.
    Structural Engineer. Analysis and assessment of elevated spent fuel tank structure for high density racks. (1989 to 1990)

- **Commonwealth Edison Company**
  - Byron 1 and 2/Braidwood 1 and 2, nuclear, 1175 MW each.
    Structural Engineer. Spent fuel pool structure assessment for high density racks sliding impact in response to NRC questions and concerns. (1988)

  - Dresden 2 and 3, nuclear, 850 MW each.
    Structural Engineering Specialist. Analysis and assessment of reactor support pedestal for accident temperature. (1976)

  - Quad Cities 1 and 2, nuclear, 850 MW each.
    Structural Engineering Specialist. Seismic analysis of reactor crane system, cask drop and missile impact analyses. (1975)

- **PSI Energy**
  - Gibson 3, coal, 618 MW.
    Structural Engineering Specialist. Seismic evaluation of structural steel work. (1975)

HONORS

Certificate from the Structural Engineering Association of Illinois for significant contribution to the design of the 1983 Best Structure Award winning Clinton Nuclear Containment and Drywell Structure (June 1983)

PUBLICATIONS

Co-authored the following technical papers:

"Liner Integrity of Overpressurized Concrete Containments", presented at the Second Workshop on Containment Integrity hosted by Sandia National Laboratories, Crystal, West Virginia, June 1984

"Ultimate Internal Pressure Capacity of BWR Concrete Containment Structures," presented at the 7th International Conference on Structural Mechanics in Reactor Technology, Chicago, Illinois, August 1983

"Structural Integrity Testing of Prestress Concrete Containments," presented at the 7th International Conference on Structural Mechanics in Reactor Technology, Chicago, Illinois, August 1983

"Behavior and Ultimate Strength of Reinforced Flyash Concrete Beams," (M.S. Thesis) Cement & Concrete, India, July to September 1971

REGISTRATION

Registered Professional Engineer, State of Illinois (April 1995)

VT-1C General Examination

Name RAJAGOPAL NAMPERUMAL Date 5-22-2000

Weighing Factor 33.3% Grade 75% (15/20)

Graded by [signature] Date 5/22/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 20 questions relating to the general requirements and basic principles of the VT-1C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this general test is a requirement of ASME Section XI and SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

R. Nampermal
Level II Candidate

5-22-2000.
Date

[signature]
Responsible Engineer

5/23/00
Date

VT-1C Specific Examination

Name RAJAGOPAL NAMPERUMAL Date 5-22-2000

Weighing Factor 33.3% Grade 100%

Graded by [signature] Date 5/22/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 15 questions relating to the specific procedural and ASME Section XI requirements for the VT-1C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this specific test is a requirement of ASME Section XI and SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature]
Level II Candidate

5-22-2000
Date

[signature]
Responsible Engineer

5/23/00
Date

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Rajagopal Namperumal

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-1C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James W. Doyle Date: 5/10/00

VT-3C General Examination

Name RAJAGOPAL NAMPERUMA Date 5-22-2000

Weighing Factor 33.3% Grade 85% (17/20)

Graded by [signature] Date 5/22/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 20 questions relating to the general requirements and basic principles of the VT-3C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this general test is a requirement of ASME Section XI and SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature]
Level II Candidate

5-22-2000
Date

[signature]
Responsible Engineer

5/23/00
Date

VT-3C Specific Examination

Name RAJAGOPAL NAMBURU Date 5-22-2000

Weighing Factor 33.3% Grade 93%

Graded by [signature] Date 5/22/00

THIS IS A CLOSED BOOK TEST

Instructions:

This test consists of 15 questions relating to the specific procedural and ASME Section XI requirements for the VT-3C method. Read each question and select the answer you feel is correct. There is only one correct answer for each question.

Upon completion of grading and review of this test, sign and date the following statement:

I acknowledge that this specific test is a requirement of ASME Section XI an SNT-TC-1A and is used to demonstrate my knowledge of the codes, standards, procedures and visual examination methods covered by this test.

[signature] 5-22-2000

Level II Candidate Date

[signature] 5/23/00

Responsible Engineer Date

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Rajagopal Nampermal

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-3C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James M. Doyle Date: 5/10/00

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Rajagopal Namperumal

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-1C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James W. Doyle Date: 5/10/00

FORM VT-1C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-1C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: ORNAMENTAL BRIDGE HANDRAIL

ZONE NUMBER: N/A DRAWING NO.: N/A

EQUIPMENT USED: N/A

Recording Conditions		RI	NRI	NI	NA	Comments
7.1.1.a	Leaching or chemical attack			✓		
7.1.1.b	Abrasion or erosion			✓		
7.1.1.c	Popouts or voids			✓		
7.1.1.d	Scaling	✓				SEVERE SCALING EXPOSING REBAR
7.1.1.e	Spalling	✓				
7.1.1.f	Corrosion staining			✓		
7.1.1.g	Cracks			✓		
7.1.1.h	Settlement or deflection			✓		
7.1.1.i	Exposed reinforcing steel	✓				
7.1.1.j	Coating deterioration				✓	

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: R. Rajagopal RAJAGOPAL NAM TOWNSEND Date: 5-10-2000

RESPONSIBLE ENGINEER REVIEW:

Acceptable: Yes ☐ No ☐

Engineering Evaluation Required: Yes ☐ No ☐ Evaluation No.: _____

Comments: _____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Rajagopal Namperumal

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-3C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James M. Doyle Date: 5/10/00

FORM VT-3C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-3C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: PARKING GARAGE CEILING

ZONE NUMBER: N/A DRAWING NO.: N/A

EQUIPMENT USED: N/A

Recording Conditions	RI	NRI	NI	NA	Comments
7.1.1.a Leaching or chemical attack	✓				White deposits found in 3 locations.
7.1.1.b Abrasion or erosion			✓		
7.1.1.c Popouts or voids		✓			Less than 2"
7.1.1.d Scaling			✓		
7.1.1.e Spalling			✓		
7.1.1.f Corrosion staining		✓			Minor rusting of exposed Reinforcing
7.1.1.g Cracks		✓			Hairline cracks, slab cracks < .03"
7.1.1.h Settlement or deflection			✓		
7.1.1.i Exposed reinforcing steel			✓		
7.1.1.j Coating deterioration				✓	

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: R. Nampelmuth RAJAGOPAL NAMPELLY Date: 5-10-2000

RESPONSIBLE ENGINEER REVIEW:

Acceptable: Yes ☐ No ☐ (VT-1C Examination Required)

Comments: _____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Chris Sward

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-1C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: James M. Doyle Date: 5/10/00

FORM VT-1C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-1C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: Ornamental handrail
ZONE NUMBER: N/A DRAWING NO.: N/A
EQUIPMENT USED: none - direct visual

Recording Conditions		RI	NRI	NI	NA	Comments
7.1.1.a	Leaching or chemical attack			✓		
7.1.1.b	Abrasion or erosion			✓		
7.1.1.c	Popouts or voids			✓		
7.1.1.d	Scaling	✓				very severe
7.1.1.e	Spalling	✓				surface spalls caused by rebar corrosion
7.1.1.f	Corrosion staining			✓		
7.1.1.g	Cracks			✓		
7.1.1.h	Settlement or deflection			✓		
7.1.1.i	Exposed reinforcing steel	✓				Rebar corroded & exposed.
7.1.1.j	Coating deterioration				✓	

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: Rob Savard Date: 5/10/00

RESPONSIBLE ENGINEER REVIEW:

Acceptable: Yes ☐ No ☐

Engineering Evaluation Required: Yes ☐ No ☐ Evaluation No.: _____

Comments: _____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

CONTAINMENT ISI EXAMINER CERTIFICATION

DEMONSTRATION EXAMINATION CHECKLIST

Name: Chris Sward

SSN: [redacted]

Date of Examination: 5/10/00

Examination Method: VT-3C

Inspection Point	Point Value	Points Granted/ Comments
1. Select procedure - verify revision	10	✓
2. Select form - verify revision	5	✓
3. Record component number	5	✓
4. Select equipment	5	✓
5. Verify adequacy of lighting	10	✓
6. Inspect component/ identify indications	15	✓
7. Compare indications to acceptance criteria	15	✓
8. Correctly record indications	25	✓
9. Sign and date form	5	✓
10. Form complete and legible	5	✓

100%

Instructor's Signature: Jeremy L. Doyle Date: 5/10/00

FORM VT-3C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-3C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: Parking Garage Ceiling
ZONE NUMBER: N/A DRAWING NO.: N/A
EQUIPMENT USED: none - direct visual

Recording Conditions		RI	NRI	NI	NA	Comments
7.1.1.a	Leaching or chemical attack	✓				efflorescence from cracks
7.1.1.b	Abrasion or erosion			✓		
7.1.1.c	Popouts or voids		✓			multiple popouts < 2" dia.
7.1.1.d	Scaling			✓		
7.1.1.e	Spalling			✓		
7.1.1.f	Corrosion staining		✓			minor rusting on feet of rebar chairs
7.1.1.g	Cracks		✓			multiple hairline cracks
7.1.1.h	Settlement or deflection			✓		
7.1.1.i	Exposed reinforcing steel			✓		
7.1.1.j	Coating deterioration				✓	

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: Chris Sward Date: 5/10/00

RESPONSIBLE ENGINEER REVIEW:

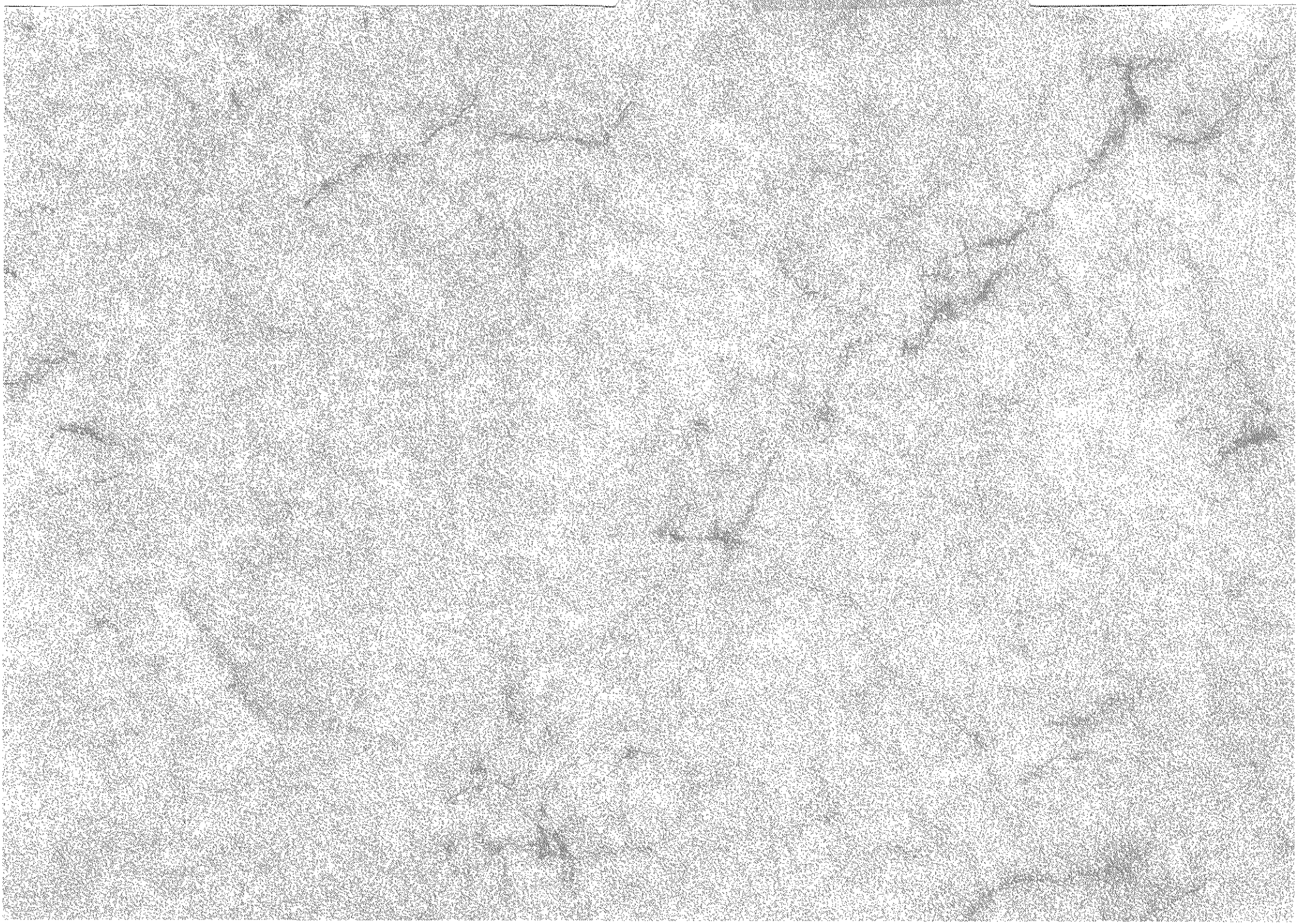
Acceptable: Yes ☐ No ☐ (VT-1C Examination Required)

Comments: _____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____



Category L-A, Concrete Examinations

Tab F - Inspection Procedures

CONTAINMENT INSERVICE INSPECTION PER ASME SECTION XI SUBSECTION IWL

VT-1C VISUAL EXAMINATIONS

Prepared by:		Date:	5/10/00
Reviewed by:		Date:	5/10/00
Approved by:	Project Manager	Date:	5-10-00
Approved by:	Responsible Engineer	Date:	5/10/00

CONTAINMENT INSERVICE INSPECTION
VT-1C EXAMINATIONS

1. PURPOSE

This procedure provides instructions and recording criteria for the performance of VT-1C examinations during preservice and inservice inspection of the Indian Point 2 (IP2) concrete containment. The VT-1C examination is conducted to determine concrete deterioration and distress for suspect areas detected by VT-3C examination.

2. SCOPE AND LIMITATIONS

2.1 The instructions and criteria contained herein establish the minimum requirements necessary to accomplish VT-1C examinations of the reinforced or post-tensioned concrete in Class CC concrete containments.

2.2 These instructions and criteria are in compliance with ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWA and IWE, 1992 Edition with 1992 Addenda with specific relief as described herein.

2.3 The components to be examined under this procedure and the limits or boundaries of the examination are defined in the IP2 Containment Inservice Inspection Program Plan and inspection drawings referenced therein.

3. RESPONSIBILITIES

3.1 VT-1C Examiner - The Examiner shall perform the examinations and record the results as prescribed in this procedure, including performing the required VT-1C examinations, identifying/categorizing what is found during such examinations and recording what is found for further evaluation. The Examiner shall be certified as a Level II or Level III VT-1C Examiner in accordance with Project Instruction IP2-CISI-006.

3.2 Responsible Engineer - The Responsible Engineer shall be a Registered Professional Engineer experienced in evaluating the in-service condition of structural concrete and knowledgeable in the codes and criteria used in the design and construction of concrete containments in nuclear power plants. The Responsible Engineer shall be responsible for the following:

a. Development of plans and procedures for examination of concrete surfaces;

b. Approval, instruction, and training of concrete examination personnel;

c. Evaluation of examination results;

d. Preparation of repair procedures.

e. Submittal of reports to the Owner documenting results of examinations and repairs.

4. DEFINITIONS

4.1 Engineering Evaluation - an evaluation of indications that exceed allowable acceptance standards to determine if the margins required by the Design Specification or Construction Code are maintained.

4.2 Evaluation - the process of determining the significance of examination results, including the comparison of examination results with applicable acceptance criteria or previous results.

4.3 Examination – The process of making visual observation of an item, area, or component to detect imperfections.

4.4 Interpretation - The act of determining the nature or identity of an observed condition and its relevancy according to the examination criteria.

5. MATERIALS AND EQUIPMENT

5.1 A near distance vision test chart containing text with lower case characters without an ascender or descender (e.g., a,c,e,o), with maximum lower case height of 0.044 inches is required for procedure demonstration. Measurements of the near distance test chart shall be made once before initial use with an optical comparator (10X or greater) or other suitable instrument to verify that the height of a representative lower case character meets the height requirement.

5.2 Flashlights and/or portable lighting

5.3 Borescopes, mirrors, binoculars, telescopes, closed circuit television, cameras or other devices may be used for remote examination, provided such devices or systems have a resolution capability meeting the requirements of Section 6.1.4.

5.4 Magnifying glasses, mirrors, rulers, protractors, crack comparators and other instruments may be used to supplement direct examination as required.

6. EXAMINATION INSTRUCTIONS

6.1 Examination Conditions

6.1.1 Access to the containment surfaces for direct visual examination shall enable an examination within 24 inches of the surface. In cases where location, obstruction, safety or health physics considerations render an area inaccessible for examination at this distance, remote optical aides shall be used as prescribed in Section 6.1.4 (as allowed by Relief Request No. 45).

6.1.2 Surface areas being examined shall be illuminated, if necessary, by auxiliary light sources to attain a minimum illumination level of 50 foot-candles. For battery powered lighting sources, illumination levels shall be checked before and after each series of examinations, not exceeding 4 hours between checks.

6.1.3 Adequacy of this visual examination procedure shall be demonstrated at least once to confirm that the characters described in Section 5.1 can be viewed at the distance specified in Section 6.1.1 under lighting specified in Section 6.1.2.

6.1.4 When performing remote VT-1C examination, the maximum direct examination distance specified in Section 6.1.1 may be increased and the minimum illumination requirements specified in Section 6.1.2 may be decreased, provided that the conditions or indications for which the VT-1C examination is performed can be detected at the chosen distance and illumination. The remote examination parameters and equipment used shall be demonstrated to the satisfaction of the Responsible Engineer and the ANII (at his option) and documented.

6.1.5 The concrete surfaces shall be free of dirt, contamination or other debris that could interfere with the examination. Any existing coatings on concrete surfaces need not be removed prior to examination, unless directed by the Responsible Engineer.

a. If required by the Responsible Engineer, mechanical cleaning methods or approved solvents shall be used to remove the interference prior to examination.

b. If the concrete surfaces must be cleaned of unusual contaminants to ensure a complete examination, the nature of the contaminants shall be described on Form VT-1C.

6.2 Areas to be Examined

VT-1C examinations shall be performed on the accessible concrete surfaces. Inaccessible surfaces include those that are covered by the steel liner, foundation material or backfill, or are otherwise obstructed by adjacent structures, components, parts, or appurtenances.

6.3 Conditions to Examine for:

6.3.1 Concrete surface areas requiring VT-1C examination shall be examined for the conditions noted below. References 8.3 and 8.4 may be used a guidelines for identifying and describing these conditions.

a. Leaching or chemical attack

b. Abrasion or erosion degradation

c. Popouts and voids

d. Scaling

e. Spalling

f. Corrosion staining on concrete surface

g. Cracks

h. Overall alignment of structure

i. Exposed reinforcing steel

j. Deterioration of concrete coating (if applicable)

6.4 Data Recording

6.4.1 The Examiner shall record the results of the visual examination on Form VT-1C. Each recording condition listed in the form shall be marked to record the condition as one of the following:

a. "RI" for Recordable Indications per the criteria of Section 7.1,

b. "NRI" for Non-Recordable Indications conditions per the criteria in Section 7.2,

c. "NI" if no indications were found, or

d. "NA" if the condition is not applicable for the subject component.

6.4.2 The recording criteria of Section 7.0 establish the minimum conditions that the visual examiner must record. The examiner is to interpret the observed conditions and record what is found as either "Recordable Indications" or as "Non-Recordable Indications." Other observed conditions not specifically addressed herein but judged to be relevant should be recorded. Recording observed conditions according to this procedure does not establish either acceptance or rejection of the item/component containing the recorded conditions.

6.4.3 Upon completion of the examination and after finalizing the data in Form VT-1C, the Examiner shall sign and date the form.

6.5 Evaluation

6.5.1 The Responsible Engineer shall review "Recordable Indications" and ""Non-Recordable Indications" and evaluate them, based on his experience, expertise and additional investigation if warranted, to determine if a condition exists which needs further evaluation and documentation in accordance with the applicable problem identification process (e.g. Condition Reporting).

6.5.2 The condition of the concrete is acceptable if the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or repair.

6.5.3 For conditions which require further evaluation, the Responsible Engineer shall be responsible for the preparation of an Engineering Evaluation Report. The report shall document the following:

a. The cause of the condition;

b. The acceptability of the concrete containment without repair of the item;

c. Whether or not repair or replacement is required and, if required, the extent, method and completion date for the repair or replacement;

d. Extent, nature and frequency of additional examinations

6.5.4 The Responsible Engineer shall evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. For inaccessible areas so identified, the Responsible Engineer shall provide the following in the Engineering Evaluation Report:

a. A description of the type and estimated extent of degradation, and the conditions that led to the degradation;

b. An evaluation of each area, and the result of the evaluation, and;

c. A description of necessary corrective actions.

6.5.5 The Responsible Engineer shall make recommendations following his evaluation of the indications. Such recommendations shall be documented on Form VT-1C, in the Engineering Evaluation Report and in other appropriate documents imposed by plant procedures. Form VT-1C should reference and be traceable to these other documents.

6.5.6 Upon completion of his evaluation and initiation of subsequent action as required, the Responsible Engineer shall sign and date Form VT-1C and forward it to the Authorized Nuclear Inservice Inspector (ANII) for review or as otherwise directed by the ISI coordinator.

6.5.7 The corrective action performed must be documented in accordance with the applicable plant programs and procedures and the documentation must be traceable to the original VT-1C examination report for close-out.

7. RECORDING CRITERIA

7.1 Recordable Indications

A Recordable Indication is a condition observed during the VT-1C examination that requires supplemental examination or analytical evaluation to accept it or one that requires repair, replacement or other corrective measures to allow further use. The conditions described in the following paragraphs shall be documented as "Recordable Indications."

7.1.1 General Conditions

a. Any appearance of leaching or chemical attack.

b. Any areas of abrasion or erosion.

c. Popouts or voids greater than 2" in diameter or equivalent surface area.

d. Scaling greater than 3/16" in depth

e. Spalls greater than 3/8" in depth or 4" in any surface dimension

f. Corrosion staining of undefined source on the concrete surfaces

g. Cracks greater than 0.030" in maximum width (other than localized widening at the surface of the concrete).

h. Any settlement or deflection visible to the unaided eye.

i. Any occurrence of exposed reinforcing steel.

j. Any evidence of concrete coating deterioration (if applicable)

Note: Measurement of indications shall be made using normal inspection tools such as scales and visual comparators. For remote examination, measurement shall be performed by visual comparison to known dimensions at the same distance.

7.2 Non-Recordable Conditions

Conditions that are noted by the Examiner during the VT-1C Examination that, following his interpretation of the condition, is determined not to be a Recordable Indication may be recorded as an "Non-Recordable Indication" for informational purposes.

8. REFERENCES

8.1 Code of Federal Regulations; Title 10, Energy; Part 50, Domestic Licensing of Production and Utilization Facilities; Section 50.55a, Codes and Standards, paragraphs (b)(2), (b)(2)(vi), (b)(2)(ix), (b)(2)(x), (g)(4), (g)(4)(v) and (g)(6)(ii)(B). Effective date: September 9, 1996.

8.2 ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL, 1992 Edition with 1992 Addenda.

8.3 ACI 201.1R-68, "Guide for Making a Condition Survey of Concrete in Service,". American Concrete Institute, 1992.

8.4 ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," American Concrete Institute, March 1996.

8.5 IP2-CISI-006, "Containment Inservice Inspection - Certification for VT-C Examiners"

8.6 Relief Request No. 45, "VT Illumination and Distance," approved February 4, 2000

9. ATTACHMENTS

9.1 Form VT-1C, Record of VT-1C Examination (2 pages)

9.2 Exhibit A, Demonstration of Remote Examination Method

FORM VT-1C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-1C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: _____

ZONE NUMBER: _____ DRAWING NO.: _____

EQUIPMENT USED: _____

Recording Conditions		RI	NRI	NI	NA	Comments
7.1.1.a	Leaching or chemical attack					
7.1.1.b	Abrasion or erosion					
7.1.1.c	Popouts or voids					
7.1.1.d	Scaling					
7.1.1.e	Spalling					
7.1.1.f	Corrosion staining					
7.1.1.g	Cracks					
7.1.1.h	Settlement or deflection					
7.1.1.i	Exposed reinforcing steel					
7.1.1.j	Coating deterioration					

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: _____ Date: _____

RESPONSIBLE ENGINEER REVIEW:

Acceptable: Yes ☐ No ☐

Engineering Evaluation Required: Yes ☐ No ☐ Evaluation No.: _____

Comments: _____

_____

_____

_____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

FORM VT-1C (cont.)
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-1C EXAMINATION

COMMENT SHEET

STATION/UNIT: Indian Point 2 COMPONENT NO.: _____

No.	Comment	Initials

EXHIBIT A

CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-1C EXAMINATION

DEMONSTRATION OF REMOTE EXAMINATION METHOD

STATION/UNIT: Indian Point 2 DATE: _____

EQUIPMENT USED:

_____

_____

_____

DESCRIPTION OF DEMONSTRATION: (Include discussion of approximate viewing distance, lighting conditions and resolution achieved.)

_____

_____

_____

_____

_____

_____

_____

_____

LIMITATIONS:

_____

_____

_____

DEMONSTRATION PERFORMED BY:

Signature: _____ Date: _____

DEMONSTRATION WITNESSED BY:

Signature: _____ Date: _____

RESPONSIBLE ENGINEER REVIEW:

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

CONTAINMENT INSERVICE INSPECTION PER ASME SECTION XI SUBSECTION IWL

VT-3C VISUAL EXAMINATIONS

Prepared by: _____ Date: 5/10/00

Reviewed by: _____ Date: 5/10/2000

Approved by: _____ Date: 5-10-00
Project Manager

Approved by: _____ Date: 5/10/00
Responsible Engineer

CONTAINMENT INSERVICE INSPECTION
VT-3C EXAMINATIONS

1. PURPOSE

This procedure provides instructions and recording criteria for the performance of VT-3C examinations during preservice and inservice inspection of the Indian Point 2 (IP2) concrete containment. The VT-3C examination is conducted to determine the general condition of the concrete structure.

2. SCOPE AND LIMITATIONS

2.1 The instructions and criteria contained herein establish the minimum requirements necessary to accomplish VT-3C examinations of the reinforced or post-tensioned concrete in Class CC concrete containments.

2.2 These instructions and criteria are in compliance with ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWA and IWE, 1992 Edition with 1992 Addenda with specific relief as described herein.

2.3 The components to be examined under this procedure and the limits or boundaries of the examination are defined in the IP2 Containment Inservice Inspection Program Plan and inspection drawings referenced therein.

3. RESPONSIBILITIES

3.1 VT-3C Examiner - The Examiner shall perform the examinations and record the results as prescribed in this procedure, including performing the required VT-3C examinations, identifying/categorizing what is found during such examinations and recording what is found for further evaluation. The Examiner shall be certified as a Level II or Level III VT-3C Examiner in accordance with Project Instruction IP2-CISI-006.

3.2 Responsible Engineer - The Responsible Engineer shall be a Registered Professional Engineer experienced in evaluating the in-service condition of structural concrete and knowledgeable in the codes and criteria used in the design and construction of concrete containments in nuclear power plants. The Responsible Engineer shall be responsible for the following:

a. Development of plans and procedures for examination of concrete surfaces;

b. Approval, instruction, and training of concrete examination personnel;

c. Evaluation of examination results;

d. Preparation of repair procedures.

e. Submittal of reports to the Owner documenting results of examinations and repairs.

4. DEFINITIONS

4.1 Engineering Evaluation - an evaluation of indications that exceed allowable acceptance standards to determine if the margins required by the Design Specification or Construction Code are maintained.

4.2 Evaluation - the process of determining the significance of examination results, including the comparison of examination results with applicable acceptance criteria or previous results.

4.3 Examination – The process of making visual observation of an item, area, or component to detect imperfections.

4.4 Interpretation - The act of determining the nature or identity of an observed condition and its relevancy according to the examination criteria.

5. MATERIALS AND EQUIPMENT

5.1 A near distance vision test chart containing text with lower case characters without an ascender or descender (e.g., a,c,e,o), with maximum lower case height of 0.105 inches is required for procedure demonstration. Measurements of the near distance test chart shall be made once before initial use with an optical comparator (10X or greater) or other suitable instrument to verify that the height of a representative lower case character meets the height requirement.

5.2 Flashlights and/or portable lighting

5.3 Borescopes, mirrors, binoculars, telescopes, closed circuit television, cameras or other devices may be used for remote examination, provided such devices or systems have a resolution capability meeting the requirements of Section 6.1.4.

5.4 Magnifying glasses, mirrors, rulers, protractors, crack comparators and other instruments may be used to supplement direct examination as required.

6. EXAMINATION INSTRUCTIONS

6.1 Examination Conditions

6.1.1 Access to the containment surfaces for direct visual examination shall enable an examination within 48 inches of the surface. In cases where location, obstruction, safety or health physics considerations render an area inaccessible for examination at this distance, remote optical aides shall be used as prescribed in Section 6.1.4 (as allowed by Relief Request No. 45).

6.1.2 Surface areas being examined shall be illuminated, if necessary, by auxiliary light sources to attain a minimum illumination level of 50 foot-candles. For battery powered lighting sources, illumination levels shall be checked before and after each series of examinations, not exceeding 4 hours between checks.

6.1.3 Adequacy of this visual examination procedure shall be demonstrated at least once to confirm that the characters described in Section 5.1 can be viewed at the distance specified in Section 6.1.1 under lighting specified in Section 6.1.2.

6.1.4 When performing remote VT-3C examination, the maximum direct examination distance specified in Section 6.1.1 may be increased and the minimum illumination requirements specified in Section 6.1.2 may be decreased, provided that the conditions or indications for which the VT-3C examination is performed can be detected at the chosen distance and illumination. The remote examination parameters and equipment used shall be demonstrated to the satisfaction of the Responsible Engineer and the ANII (at his option) and documented.

6.1.5 The concrete surfaces shall be free of dirt, contamination or other debris that could interfere with the examination. Any existing coatings on concrete surfaces need not be removed prior to examination, unless directed by the Responsible Engineer.

a. If required by the Responsible Engineer, mechanical cleaning methods or approved solvents shall be used to remove the interference prior to examination.

b. If the concrete surfaces must be cleaned of unusual contaminants to ensure a complete examination, the nature of the contaminants shall be described on Form VT-3C.

6.2 Areas to be Examined

VT-3C examinations shall be performed on the accessible concrete surfaces. Inaccessible surfaces include those that are covered by the steel liner, foundation material or backfill, or are otherwise obstructed by adjacent structures, components, parts, or appurtenances.

6.3 Conditions to Examine for:

6.3.1 Concrete surface areas requiring VT-3C examination shall be examined for the conditions noted below. References 8.3 and 8.4 may be used a guidelines for identifying and describing these conditions.

a. Leaching or chemical attack

b. Abrasion or erosion degradation

c. Popouts and voids

d. Scaling

e. Spalling

f. Corrosion staining on concrete surface

g. Cracks

h. Overall alignment of structure

i. Exposed reinforcing steel

j. Deterioration of concrete coating (if applicable)

6.4 Data Recording

6.4.1 The Examiner shall record the results of the visual examination on Form VT-3C. Each recording condition listed in the form shall be marked to record the condition as one of the following:

a. "RI" for Recordable Indications per the criteria of Section 7.1,

b. "NRI" for Non-Recordable Indications per the criteria in Section 7.2,

c. "NI" if no indications were found, or

d. "NA" if the condition is not applicable for the subject component.

6.4.2 The recording criteria of Section 7.0 establish the minimum conditions that the visual examiner must record. The examiner is to interpret the observed conditions and record what is found as either "Recordable Indications" or as "Non-Recordable Indications." Other observed conditions not specifically addressed herein but judged to be relevant should be recorded. Recording observed conditions according to this procedure does not establish either acceptance or rejection of the item/component containing the recorded conditions.

6.4.3 Upon completion of the examination and after finalizing the data in Form VT-3C, the Examiner shall sign and date the form.

6.5 Evaluation

6.5.1 The Responsible Engineer shall review "Recordable Indications" and "Non-Recordable Indications" and evaluate them, based on his experience, expertise and additional investigation if warranted, to determine if a condition exists which needs further evaluation.

6.5.2 The condition of the concrete is acceptable if the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation.

6.5.3 For conditions which require further evaluation, the Responsible Engineer shall initiate a VT-1C examination to further evaluate and characterize the condition.

7. RECORDING CRITERIA

7.1 Recordable Indications

A Recordable Indication is a condition observed during the VT-3C examination that requires supplemental examination or analytical evaluation to accept it or one that requires repair, replacement or other corrective measures to allow further use. The conditions described in the following paragraphs shall be documented as "Recordable Indications."

7.1.1 General Conditions

a. Any appearance of leaching or chemical attack.

b. Any areas of abrasion or erosion.

c. Popouts or voids greater than 2" in diameter or equivalent surface area.

d. Scaling greater than 3/16" in depth

e. Spalls greater than 3/8" in depth or 4" in any surface dimension

f. Corrosion staining of undefined source on the concrete surfaces

g. Cracks greater than 0.030" in maximum width (other than localized widening at the surface of the concrete).

h. Any settlement or deflection visible to the unaided eye.

i. Any occurrence of exposed reinforcing steel.

j. Any evidence of concrete coating deterioration (if applicable)

Note: Measurement of indications shall be made using normal inspection tools such as scales and visual comparators. For remote examination, measurement shall be performed by visual comparison to known dimensions at the same distance.

7.2 Non-Recordable Indications

Conditions that are noted by the Examiner during the VT-3C Examination that, following his interpretation of the condition, is determined not to be a Recordable Indication may be recorded as a "Non-Recordable Indication" for informational purposes.

8. REFERENCES

8.1 Code of Federal Regulations; Title 10, Energy; Part 50, Domestic Licensing of Production and Utilization Facilities; Section 50.55a, Codes and Standards, paragraphs (b)(2), (b)(2)(vi), (b)(2)(ix), (b)(2)(x), (g)(4), (g)(4)(v) and (g)(6)(ii)(B). Effective date: September 9, 1996.

8.2 ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL, 1992 Edition with 1992 Addenda.

8.3 ACI 201.1R-68, "Guide for Making a Condition Survey of Concrete in Service,". American Concrete Institute, 1992.

8.4 ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," American Concrete Institute, March 1996.

8.5 IP2-CISI-006, "Containment Inservice Inspection - Certification for VT-C Examiners"

8.6 Relief Request No. 45, "VT Illumination and Distance," approved February 4, 2000.

9. ATTACHMENTS

9.1 Form VT-3C, Record of VT-3C Examination (2 pages)

9.2 Exhibit A, Demonstration of Remote Examination Method

FORM VT-3C
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-3C EXAMINATION

STATION/UNIT: Indian Point 2 COMPONENT NO.: _____

ZONE NUMBER: _____ DRAWING NO.: _____

EQUIPMENT USED: _____

Recording Conditions		RI	NRI	NI	NA	Comments
7.1.1.a	Leaching or chemical attack					
7.1.1.b	Abrasion or erosion					
7.1.1.c	Popouts or voids					
7.1.1.d	Scaling					
7.1.1.e	Spalling					
7.1.1.f	Corrosion staining					
7.1.1.g	Cracks					
7.1.1.h	Settlement or deflection					
7.1.1.i	Exposed reinforcing steel					
7.1.1.j	Coating deterioration					

(Note: Sketches may be attached to clarify inspection areas and locations of indications.)

EXAMINED BY: _____ Date: _____

RESPONSIBLE ENGINEER REVIEW:

Acceptable: Yes ☐ No ☐ (VT-1C Examination Required)

Comments: _____

_____

_____

_____

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

FORM VT-3C (cont.)
CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-3C EXAMINATION

COMMENT SHEET

STATION/UNIT: Indian Point 2 COMPONENT NO.: _____

No.	Comment	Initials

EXHIBIT A

CONTAINMENT INSERVICE INSPECTION
RECORD OF VT-3C EXAMINATION

DEMONSTRATION OF REMOTE EXAMINATION METHOD

STATION/UNIT: Indian Point 2 DATE: _____

EQUIPMENT USED:

_____

_____

_____

DESCRIPTION OF DEMONSTRATION: (Include discussion of approximate viewing distance, lighting conditions and resolution achieved.)

_____

_____

_____

_____

_____

_____

_____

_____

LIMITATIONS:

_____

_____

_____

DEMONSTRATION PERFORMED BY:

Signature: _____ Date: _____

DEMONSTRATION WITNESSED BY:

Signature: _____ Date: _____

RESPONSIBLE ENGINEER REVIEW:

Signature: _____ Date: _____

AUTHORIZED NUCLEAR INSPECTOR (ANII) REVIEW:

Signature: _____ Date: _____

CONTAINMENT INSERVICE INSPECTION PER ASME SECTION XI SUBSECTION IWL

CERTIFICATION OF VT-C EXAMINERS

Prepared by: _____ Date: 5/10/00

Reviewed by: _____ Date: 5/10/2000

Approved by: _____ Date: 5-10-00
Project Manager

Approved by: _____ Date: 5/10/00
Responsible Engineer

CONTAINMENT INSERVICE INSPECTION CERTIFICATION OF VT-C EXAMINERS

1. PURPOSE

This instruction provides a written practice for qualification, training and certification of Sargent and Lundy personnel involved in visual examination (VT) activities performed for preservice and inservice inspection of the Indian Point 2 (IP2) concrete containment.

2. SCOPE

2.1 The instructions and criteria contained herein establish the minimum requirements for certification of examiners to perform VT-1C and VT-3C examinations of the reinforced concrete in Class CC concrete containments. This is considered a limited certification per IWA-2350 as it is only applicable to non-prestressed containment concrete.

2.2 These instructions and criteria are in compliance with ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWA and IWE, 1992 Edition with 1992 Addenda with specific relief as described herein.

2.2 This written practice is modeled after the requirements in ASNT Recommended Practice SNT-TC-1A, 1984 Edition. IP2 is committed to SNT-TC-1A, in lieu of ASNT CP-189 as prescribed by IWA-2310, per Relief Request No. 44.

3. DEFINITIONS

3.1 Certification - written testimony of qualification.

3.2 Experience – actual performance of visual examinations or observation of the condition of components conducted during work time resulting in the acquisition of skill and knowledge. Classroom and laboratory training time shall not be considered as experience.

3.3 Qualification - Demonstrated skill, training, knowledge and experience required for personnel to properly perform the duties of a specific job.

3.4 Training - the program developed to impart the knowledge and skills necessary for qualification.

3.5 VT Examination - examination performed to evaluate an item or component by visual observation.

3.6 Written Practice - the procedure written to control and administer personnel training, examination, and certification of the VT-C program. A set of guidelines to assist the employer in developing uniform procedures for the qualification and certification of nondestructive testing personnel to satisfy the employer's specific requirements.

4. QUALIFICATION LEVELS AND RESPONSIBILITIES

4.1 Instructor

An individual who has the skills and knowledge to plan, organize, and present classroom, laboratory, or on-the-job training programs in accordance with course outlines. This may

be the Responsible Engineer, a Level III VT-C Examiner or another individual without certification if approved by the Responsible Engineer.

4.2 Level I VT-C Examiner

4.2.1 A Level I VT-C Examiner may perform specific calibrations, specific tests, and specific evaluations for acceptance or rejection determinations according to written instructions and to record results.

4.2.2 The Level I VT-C Examiner shall receive the necessary instruction or supervision from a certified Level II or Level III individual.

4.2.3 A Level I VT-C Examiner cannot interpret examination results.

4.3 Level II VT-C Examiner

4.3.1 The Level II VT-C examiner may set up and calibrate equipment and interpret and evaluate results with respect to applicable codes, standards, and specifications.

4.3.2 The Level II VT-C Examiner shall be thoroughly familiar with the scope and limitations of the methods for which the individual is qualified and shall exercise assigned responsibility for on-the-job training and guidance of Level I personnel.

4.3.3 The Level II VT-C Examiner may prepare written instructions, and organize and report the results of VT-C examinations.

4.4 Level III VT-C Examiner

4.4.1 The duties of a Level III VT-C Examiner include establishing techniques and procedures; interpreting codes, standards, specifications, and procedures; and designating the particular test methods, techniques, and procedures to be used.

4.4.2 The Level III VT-C Examiner shall be responsible for the VT-C operations for which qualified and to which assigned, and shall be capable of interpreting and evaluating results in terms of existing codes, standards, and specifications.

4.4.3 The Level III VT-C Examiner shall have sufficient practical background in applicable materials, fabrication, and production technology to establish and to assist in establishing acceptable criteria where none are otherwise available.

4.4.4 The Level III VT-C Examiner shall have general familiarity with other appropriate NDE methods, and may train and examine VT-C Level I and Level II personnel for certification.

4.5 Responsible Engineer

4.5.1 The Responsible Engineer shall be a Registered Professional Engineer experienced in evaluating the in-service condition of structural concrete and knowledgeable in the codes and criteria used in the design and construction of concrete containments in nuclear power plants.

4.5.2 The Responsible Engineer is responsible for approval, instruction, and training of concrete examination personnel.

5. EDUCATION AND EXPERIENCE REQUIREMENTS

5.1 General

5.1.1 All levels of VT-C Examiners shall have at least a high school education, unless otherwise specified by the Responsible Engineer.

5.2 Level I

5.2.1 Required experience hours for certification to Level I are listed in Table 1.

5.3 Level II

5.3.1 Required experience hours for certification to Level II are listed in Table 1.

5.3.2 In lieu of the examination experience specified in Table 1, an individual meeting the following requirements may be certified as a Level II VT-C examiner at the Responsible Engineer's discretion:

a. Undergraduate or graduate degree in engineering or science study

b. A minimum of 5 years experience in the analysis and design of nuclear plant concrete structures and having specific knowledge of the codes and criteria used in the design and construction of concrete containments.

5.4 Level III

5.4.1 The education and experience requirements for Level III certification are:

a. High school graduate or equivalent plus 4 years of experience, or

b. Completion with a passing grade of at least 2 years of engineering or science study in an accredited university, college, or technical school plus 2 year of experience, or

c. 4-year college graduate in engineering or science study plus 1 year of experience.

6. TRAINING AND TESTING REQUIREMENTS

6.1 Vision Examination

6.1.1 All categories and levels of VT-C Examiners shall have their vision tested annually by qualified personnel.

6.1.2 The vision examination shall demonstrate natural or corrected near-distance acuity of 20/25 or greater Snellen fraction in at least one eye by reading words or identifying characters on a near-distance test chart, such as a Jaeger chart, with letters 0.022 inches in height at distance of not less than 12 inches.

6.1.3 The vision examination shall also demonstrate a natural or corrected far-distance acuity of 20/30 or greater Snellen fraction or equivalent in at least one eye.

6.1.4 The eye chart used for the examination shall be qualified once by measuring, with an optical comparator or other means, the height of a representative lower case

character without ascender or descender to verify that it meets the requirements of Section 6.1.2 for character height. The measurement of the characters shall be made once and documented and made traceable to the test chart.

6.1.5 All personnel shall demonstrate the capability to distinguish and differentiate contrast between colors used in the applicable examination method. Where an individual does not pass the general color test, the Responsible Engineer shall evaluate that he is capable of distinguishing between colors applicable to the examination method and document his evaluation in the certification record.

6.1.6 The results of the applicable eye tests shall be recorded on the Vision Examination Record (Exhibit B or equivalent) by the qualified individual who administered the eye tests.

6.1.7 Candidates who fail to meet the specified physical requirements may be awarded limited certification. This limitation shall be noted on the certificate.

6.2 Training

6.2.1 Candidates for Level I or Level II VT-C certification must complete the minimum training requirements specified in Table 1.

6.3 Testing

6.3.1 Level I

A candidate for Level I VT-C certification must demonstrate understanding in the principals and procedural requirements as follows:

a. Pass a Level I General examination consisting of at least 20 questions on the requirements and basic principles of the applicable VT-C method.

b. Pass a Level I Specific examination consisting of at least 15 questions on procedural requirements and ASME Section XI requirements for the applicable VT-C method.

c. Pass a Level I Practical examination for the applicable VT-C method to demonstrate proficiency in the VT-C method. This test shall be graded using the applicable ten point checklist. A minimum of two (2) samples are required for VT-1C and VT-3C practical examination.

d. A minimum composite score of 80% must be attained. Each practical examination score must be at least 80%. A score as low as 70% on written examinations (General and Specific) may be accepted for certification or re-certification, provided the composite score is at least 80%. The composite score weighting factors are: General - 1/3, Specific - 1/3, Practical - 1/3.

6.3.2 Level II

A candidate for Level II VT-C certification must demonstrate understanding in the principals and procedural requirements as follows:

a. Pass a Level II General examination consisting of at least 20 questions on the requirements and principles of the applicable VT-C method.

b. Pass a Level II Specific examination consisting of at least 15 questions on procedural requirements and ASME Section XI requirements for the applicable VT-C method.

c. Pass a Level II Practical examination for the applicable VT-C method to demonstrate proficiency in selecting and performing the applicable VT-C tests and interpreting and evaluating the results. This test shall be graded using the applicable ten point checklist. A minimum of two (2) samples are required for VT-1C and VT-3C practical examination.

d. A minimum composite score of 80% must be attained. Each practical examination score must be at least 80%. A score as low as 70% on written examinations (General and Specific) may be accepted for certification or recertification, provided the composite score is at least 80%. The composite score weighting factors are: General - 1/3, Specific - 1/3, Practical - 1/3.

6.3.3 Level III

A candidate for Level III VT-C certification must demonstrate understanding in the principals and procedural requirements as follows:

a. Pass a written Basic examination with a minimum score of 80% consisting of:

(1) 20 questions showing an understanding of this written practice;

(2) 15 questions on equipment techniques, code requirements, practices and specifications common to VT-1C and VT-3C; and

(3) 15 questions on general principles applicable to all VT examinations.

b. Pass a written Method examination with a minimum score of 80% on the applicable VT-C category consisting of:

(1) 30 questions on fundamentals, objectives, and principles;

(2) 15 questions on establishment and applications of techniques and procedures; and

(3) 20 questions on ability to interpret codes, standards and specifications.

c. Pass a written Specific examination with a minimum score of 80% in the applicable VT-C category consisting of 30 questions relating to S&L's VT-C procedures, practices, and policies.

d. Pass a Demonstration examination with a minimum score of 80% consisting of a Level II Practical examination in the appropriate VT-C category. This test shall be graded using the applicable ten point checklist.

e. A minimum score of 80% must be attained on each examination. The composite grade weighting factors are: Basic - 1/4, Method - 1/4, Specific - 1/4, Demonstration – 1/4.

6.4 Retraining

6.4.1 Retraining (i.e. initial VT-C training courses) of VT-C examiners is required when:

a. Their certification has been terminated and they are seeking reinstatement.

b. Their certification has been expired for more than one (1) year.

c. Failure to pass the certification or re-certification examinations more than twice.

d. Deemed necessary by the Responsible Engineer.

7. CERTIFICATION

7.1 Certification of all VT-C Examiners shall be performed by the Responsible Engineer. Training may be conducted by a Trainer designated by the Responsible Engineer provided the Responsible Engineer approves the lesson plan. Examinations may be conducted and scored by a Level III VT-C Examiner.

7.2 Certification Documents

The following documents shall be prepared and maintained for each certified individual for the duration of the certification period.

7.2.1 Certification Record

The Certification Record (Exhibit A or equivalent) shall include the following information:

a. Name of the certified individual.

b. Date of certification or re-certification.

c. Level of certification.

d. Statement indicating conformity to the qualification requirements of this procedure.

e. Approval signature of the Responsible Engineer.

f. The expiration date of the certification, which shall be three (3) years for Level I and Level II Examiners and five (5) years for Level III Examiners.

7.2.2 Vision Examination Record

a. The near vision test result must be written out numerically, for example J-1 for the Jaeger test. An "OK" or check mark is not acceptable.

b. The far vision test result must be written out numerically, for example 20/20 for the Snellen test. An "OK" or check mark is not acceptable.

c. The test method used for color vision test must be identified. The extent of any limitations must be described.

7.2.3 Education Record

The candidate's educational history shall be provided on the Education Record (Exhibit C or equivalent). Evidence of the candidate's highest educational level must be submitted. The following are acceptable forms of documentation.

a. Transcript (original or copy) verified by the Level III or authorized designee.

b. Diploma (original or copy) verified by the Level III or authorized designee.

c. Letter from the educational institution (original or copy) verified by the Level III or authorized designee.

d. Telephone memorandum between the educational institution and the Level III or authorized designee.

e. Other objective documents may be acceptable at the discretion of the Responsible Engineer.

7.2.4 Experience Record

In conjunction with a signed resume, the following are examples of acceptable documentation:

a. Experience Record (Exhibit D or equivalent) which tabulates related work experience.

b. Previous certification documents (original or copy) verified by the Level III.

c. Letters or work logs from current or previous employers where related experience was gained. These documents should contain period of employment, job responsibilities, certifications related to VT-C and signature of appropriate supervisor.

d. Other objective documents may be acceptable at the discretion of the Responsible Engineer.

7.2.5 Examinations

Original graded examinations or the original examination answer cover sheets must be maintained. Graded examinations must be signed by the Responsible Engineer or Level III Examiner. Other suitable evidence of successful completion of the examinations may be used in lieu of the original graded examinations or the original examination answer cover sheets, if deemed acceptable by the Responsible Engineer.

a. When using results of examinations administered by an outside agency, such as EPRI, a copy of the certificate of satisfactory course completion shall be used in lieu of the original graded examination or the original examination answer cover sheets.

b. Sargent and Lundy will accept an EPRI Certificate of Completion as evidence of passing the equivalent examination required for personnel certified under this practice.

c. Graded examinations that are more than 1 year old are not acceptable for certification or re-certification.

7.3 Continued Certification

7.3.1 Annual review is required of each examiner's certification to maintain that certification. The review requires an updated vision examination and review of related activities. The annual review due date is one year (12 months), from the previous vision examination.

7.3.2 All certified Level I, Level II and Level III VT-C Examiners shall take a vision examination as described in Section 6.1 and provide the documentation required by Section 7.2.2 by the annual review date.

7.3.3 In addition, examiners shall provide evidence of involvement in at least two (2) examinations (either practical exercises or actual examinations) in each certified method.

7.3.4 The Responsible Engineer shall evaluate the list of related activities submitted by each examiner and determine its adequacy for continued certification.

7.3.5 The Responsible Engineer shall complete an Annual Certification Review Record (Exhibit G or equivalent) to document that a VT-C Examiner meets the continued certification requirements. This form shall be updated at approximately 12-month intervals. An updated copy of this form shall be forwarded to each VT-C Examiner for record and proof of active certification.

7.4 Re-Certification

7.4.1 Level I and Level II VT-C Examiners shall be re-certified every three (3) years.

7.4.2 Level III VT-C Examiners shall be re-certified every five (5) years.

7.4.3 Level I and Level II VT-C Examiners shall meet the experience and training requirements of Table 2 for re-certification.

7.4.4 Re-certification shall be by examination as described in Section 6.3.

7.4.5 Documentation for re-certification shall be in accordance with Section 7.2.

7.5 Termination/Suspension of Certification

7.5.1 VT-C certification may be terminated by the Responsible Engineer for one of the following reasons:

a. Termination of employment,

b. Transfer permanently to another job function where VT-C certification is no longer required,

c. Failing a re-certification examination more than twice, or

d. Non-compliance with applicable requirements as determined by the Responsible Engineer.

(1) If termination is considered due to incompetence, the Responsible Engineer must fully review the individual's past performance. In addition, the Responsible Engineer must evaluate the individual's performance in a field examination. The individual shall be given prior notice as to the purpose of such field evaluation.

(2) In the event it is decided to terminate the certification for incompetence, a letter of termination shall be prepared by the Responsible Engineer, which sets forth the detailed reasons for termination. The letter shall be filed and distributed to all relevant department heads.

e. Expiration of certification period.

7.5.2 VT-C certification shall be suspended under the following circumstances:

a Failure to pass or provide documentation of an acceptable vision test by the annual review due date.

b. Failure to provide satisfactory evidence of involvement in related activities by the annual review due date.

c. Failure to pass a re-certification examination.

d. Non-compliance with applicable requirements as determined by the Responsible Engineer.

7.6 Reinstatement of Certification

7.6.1 Terminated certifications may be reinstated at the discretion of the Responsible Engineer. As a basis of reinstatement, the individual must complete the initial VT-C training and pass the corresponding examinations.

7.6.2 Suspension of certification shall remain in effect until re-certification is required or the following conditions are met:

a. Successful completion of a "field" VT-C examination in the suspended category to the satisfaction of the Responsible Engineer, if the suspension is solely due to the failure to meet the requirements for involvement in related activities.

b. Passing the applicable vision test if the suspension is solely due to the failure to provide documentation of having passed the vision test.

8. REFERENCES

8.1 Code of Federal Regulations; Title 10, Energy; Part 50, Domestic Licensing of Production and Utilization Facilities; Section 50.55a, Codes and Standards.

8.2 ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWA, 1992 Edition through 1992 Addenda.

8.3 American Society for Nondestructive Testing Recommended Practice SNT-TC-1A, 1984 Edition.

8.4 Relief Request No. 44, "Qualification of NDE Personnel," approved February 4, 2000.

9. ATTACHMENTS

9.1 Table 1, Minimum Experience and Training Requirements for Containment ISI VT-C Certification.

9.2 Table 2, Minimum Experience and Training Requirements for Containment ISI VT-C Re-Certification.

9.3 Exhibit A, Containment ISI VT-C Examiner Certification Record

9.4 Exhibit B, Containment ISI VT-C Examiner Vision Examination Record

9.5 Exhibit C, Containment ISI VT-C Examiner Education Record

9.6 Exhibit D, Containment ISI VT-C Examiner Experience Record (2 pages)

9.7 Exhibit E, Containment ISI VT-C Examiner Training Record

9.8 Exhibit F, Containment ISI VT-C Examiner Examination Record

9.9 Exhibit G, Containment ISI VT-C Examiner Annual Certification Review Record

TABLE-1
MINIMUM EXPERIENCE AND TRAINING REQUIREMENTS
FOR CONTAINMENT ISI VT-C CERTIFICATION

REQUIRED EXPERIENCE HOURS

	Level I		Level II	
	VT-1C	VT-3C	VT-1C	VT-3C
Minimum Hours in Specified Method	65	65	130	130
Minimum Hours in NDE (all methods)	130	130	270	270

REQUIRED TRAINING HOURS

Method	Training Required for Level I	Additional Training Required for Level II	Total Training Required for Level II
VT-1C	2	4	6
VT-3C	2	4	6

TABLE-2
MINIMUM EXPERIENCE AND TRAINING REQUIREMENTS
FOR CONTAINMENT ISI VT-C RE-CERTIFICATION

ADDITIONAL HOURS FOR RE-CERTIFICATION OF LEVEL I & LEVEL II VT-C EXAMINERS

Method	Experience Hours	Training Hours
VT-1C	20	3
VT-2C	20	3

EXHIBIT A

CONTAINMENT ISI VT-C EXAMINER

CERTIFICATION RECORD

This record certifies that

Name: _____

SSN: _____

has been examined in accordance with Project Instruction IP2-CISI-006, Revision 0 and has demonstrated the ability to perform the duties of VT-C Examiner for the methods listed below and is hereby certified to the level noted.

Method	Level
_____	_____
_____	_____

Certified by:

Name: _____ Date: _____
Responsible Engineer

Expiration Date: _____

EXHIBIT B

CONTAINMENT ISI VT-C EXAMINER

VISION EXAMINATION RECORD

Name: _____

SSN: _____

Near Distance:

Natural or corrected near-distance vision of 20/25 or greater Snellen fraction in at least one eye by reading words or characters with letters 0.022 inches in height on a standard Jaeger test chart at a distance of not less than 12 inches, or by equivalent method.

Method: ☐ Jaeger Test Chart Character height verified: ☐

☐ Alternate (describe) _____

Acuity: _____

☐ Acceptable ☐ Acceptable With Correction ☐ Unacceptable

Far Distance:

Natural or corrected far-distance vision of 20/30 or greater Snellen fraction, or equivalent, in at least one eye.

Acuity: _____

☐ Acceptable ☐ Acceptable With Correction ☐ Unacceptable

Color Perception:

Demonstrates capability of distinguishing and differentiating contrast between colors

Method:

☐ Ishihara color plates

☐ Alternate (describe) _____

☐ Acceptable ☐ Unacceptable

Testing Conducted by:

Name: _____ Title: _____

Address: _____

_____

Signature: _____ Date: _____

EXHIBIT C

CONTAINMENT ISI VT-C EXAMINER

EDUCATION RECORD

Name: _____

SSN: _____

HIGH SCHOOL & COLLEGE EDUCATION			
NAME & LOCATION OF SCHOOL	TYPE OF SCHOOL	DATES ATTENDED	GRADE/ DEGREE ACHIEVED

Records Attached:

- ☐ Transcript
- ☐ Diploma
- ☐ Letter
- ☐ Telephone Memorandum
- ☐ Other _____

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD

Name: _____

SSN: _____

I. RELATED WORK EXPERIENCE						
COMPANY & JOB TITLE	WORK PERFORMED	HOURS	FROM		TO	
			MO.	YR.	MO.	YR.

EXHIBIT D

CONTAINMENT ISI VT-C EXAMINER

EXPERIENCE RECORD (cont.)

Name: _____

SSN: _____

II. PREVIOUS CERTIFICATIONS

COMPANY	METHOD	LEVEL	BY TEST		CODE OR SPEC.	YEAR REC'D
			YES	NO		

EXHIBIT E

CONTAINMENT ISI VT-C EXAMINER

TRAINING RECORD

Name: _____

SSN: _____

TRAINING COURSES COMPLETED				
TYPE	LOCATION	HOURS	TRAINING DATE(S)	INSTRUCTOR SIGNATURE & DATE

EXHIBIT F

CONTAINMENT ISI VT-C EXAMINER

EXAMINATION RECORD

Name: _____

SSN: _____

I. INDIVIDUAL EXAMINATION RESULTS

METHOD	LEVEL	EXAM	GRADE	DATE	EXAMINED BY

II. COMPOSITE SCORE

METHOD	LEVEL	BASIC (LEVEL III)	GENERAL/ METHOD	SPECIFIC	PRACTICAL/ DEMONSTR.	COMPOSITE